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be better to kill and immediately destroy the diseased animals.

From both the military and economic points of view surra must be looked upon as a very serious matter, and its introduction into the United States would result in very heavy losses.

Barton W. Evermann spoke on 'The American Species of Shad,' stating that from time to time reports had been received by the U. S. Fish Commission of the capture of shad in the Mississippi basin, but that these reports had proved either to have no foundation or to be based on some other fish. In 1897, however, Mr. James Sowders, of Louisville, forwarded four specimens of a true shad, saying that he had taken a few each year for many years past, but that only recently had he captured them in any number. The specimens proved to be a new species, which has been named *Alosa ohioensis*; it is more slender than the Atlantic shad, and has fewer gill rakers while it is much more slender than the Alabama shad and has more gill rakers than that species.

F. A. LUCAS.

#### THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of June 2—sixteen persons present—Professor A. S. Langsdorf described the factory tests that are made on electrical machinery, illustrating the subject by lantern diagrams showing the circuits employed for the various tests, and by pictures of the machines as set up for testing in the factory.

A biographical sketch of the late Dr. A. Litton, one of the first members of the Academy, by Dr. G. C. Broadhead, was presented by Dr. Hambach.

Mr. H. A. Wheeler spoke of the occurrence, at Hematite, Mo., some forty miles below St. Louis, of a number of granite boulders, some of them showing the polishing action of ice; and accounted for their occurrence at this point, or some fifty miles beyond the southern limit of the terminal moraine, by the theory that they had been carried there on cakes of ice during the Loess period.

Mr. Wheeler and Professor Nipher discussed a recent newspaper account of the alleged

finding of a meteorite that was recently seen to fall in St. Louis, and agreed that the supposed meteorite, which both of them had examined, was merely a pyrite concretion from the coal measures, of the type called 'sulphur-balls' or 'nigger-heads,' which had probably been raked out from the grate-bars of the adjoining factory, and passed off on its discoverer as a meteorite.

Four persons were elected to active membership.

WILLIAM TRELEASE,  
Recording Secretary.

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#### DISCUSSION AND CORRESPONDENCE.

##### THE EXPLOSIVE FORCE OF VOLCANOES.

TO THE EDITOR OF SCIENCE: Mr. A. E. Verrell's hypothesis as to the explosive forces of volcanoes, published in your columns, May 23, 1902, was most interesting.

His theory as to the disassociation of the hydrogen and oxygen of the water penetrating by submarine channels to the base of the volcanoes accounts for many of the phenomena. The separation is not immediate, but the water is probably first converted into steam; this is then superheated and the oxygen is burned out and the hydrogen liberated expands with terrific force and its further heating gives it increased power. This would account for the groanings and rumblings in the mountain itself before the outbreak. When the mass of overlying matter is no longer heavy enough to resist the immense internal pressure, it gives way and a violent explosion or rather cyclonic expansion of the imprisoned gases results. This expansion is upwards, downwards and outwards, following the lines of least resistance. The surrounding atmosphere is at first pushed back with a rush, but simultaneously there is an effort towards readjustment. The superheated hydrogen at once seeks to combine with the cooler oxygen, and in the process of readjustment frequent discharges and flashes of flame are seen which explode the mixture of hydrogen and atmospheric air in combination. The process is now reversed and, instead of expansion, we have immediate contraction and condensation. Water is at once

formed and it concentrates around the dust particles and falls in a rain of mud. The reports show that the mud fell, not near the crater, but along the lower part of the mountain.

As soon as the outrushing hydrogen could combine with the oxygen of the air to form water, an immediate contraction followed. A vacuum was formed extending over areas in proportion to the volume of hydrogen ejected, and combined with the atmosphere. Hurricane phenomena on a gigantic scale were at once witnessed. Trees were uprooted and the walls of houses were pulled outwards. The clothes of the victims were torn off. The garments had acted like the screens on the Davy safety lamp—they had prevented the air between body and clothes from combining with the hydrogen, but as soon as the vacuum caused by the combination on their exterior took place they were exploded and torn off by the contained air. The extensive vacuum thus formed might also account for the sudden death of the victims, the instantaneous removal of the atmospheric pressure causing cerebral hemorrhage and paralysis. Autopsies upon the bodies of the victims would have determined the immediate cause of death. If none have been made they might still be made where the bodies were well covered.

In the absence of other demonstrable causes the tidal wave may also be accounted for on the same theory.

ROB'T H. GORDON.

CUMBERLAND, MARYLAND,

June 7, 1902.

#### SHORTER ARTICLES.

##### BLACK RAIN IN NORTH CAROLINA.

THE 'famous black rain,' so-called by the natives, fell at Louisburg, N. C., the morning of March 15, 1900.

A sample of the water which had been carefully collected came into our hands through the kindness of Professor M. S. Davis, of the Louisburg Female College. An analysis was made:

	Parts per Million.
Total residue.....	88.00
Loss on ignition.....	54.00
Non-volatile residue.....	34.00

	Parts per Million.
Chlorine .....	19.144
Oxygen consuming power—15 minutes..	1.93
Oxygen consuming power—4 hours....	2.64
Ammonia—free .....	.872
Ammonia—albumenoid .....	.04
Nitrogen as nitrates.....	.88
Nitrogen as nitrites.....	none.

About sixty per cent. of the residue was organic matter, largely soot. The chlorine content showed an unusual amount of sodium chloride. The non-volatile residue besides sodium and some calcium gave reactions for traces of iron, manganese, aluminum and zinc. The other constituents indicate ordinary rain water.

No especial phenomena were noted preceding or during the precipitation 'except an unusually black cloud and a heavy downpour of rain, accompanied by a darkness so dense as to necessitate the use of lamps for half an hour.' It had been raining for several days preceding this occurrence and the water collecting in pools out of doors showed a distinct and unusual black color. A number of samples were collected and held as a curiosity. After a few days the water became clear through the settling of a black sediment.

The situation of and amount of fuel burned in the place, as well as the time of the year, preclude accounting for the fluorescent black rain by local contamination, such as observed in numerous cases by Angus Smith and Phipson and lately by Irwin, who examined the snowfall in Manchester, England (*Journ. Soc. Chem. Ind.*, XXI, 533, 1902). While it is well known the unusual impurities in rain, snow, etc., often occur and the sources of contamination may be traced great distances, no opinion is hazarded as to the cause of this phenomenon. All such incidental observations deserve chronicling, as did the black snow which fell in Indiana in January, 1895 (*Monthly Weather Review*, 60, 19), the 'blood rain' reported by Passerine to have fallen at Florence in March of last year (*L'Orosi*, 24, 325), and the 'dust fall' in Europe the same month (reported by Hellmann and Meinardus).

CHAS. BASKERVILLE,  
H. R. WELLER.  
UNIVERSITY OF NORTH CAROLINA.